Construction

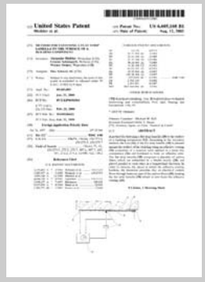
Sika® CarboHeater
for the Rapid Curing of Sika® CarboDur® Plates

Sika®

Sika® CarboHeater: Heating Device for Rapid Curing of Sika® CarboDur® Plates

Reasons for using Sika® CarboHeater

- **Fast curing** of structural adhesive: The **Sikadur®-30** and **Sikadur®-30 LP** (Long Pot Life) are epoxy based adhesives, which can be cured up to 50 times faster with the aid of the **CarboHeater**.
- **Application at low temperatures**: Structural strengthening can not be done with conventional epoxy adhesives at low surface temperatures (< 8 °C). With the **Sika® CarboHeater**, application is possible. Note: Other low temperature curing non epoxy adhesives are not recommended for use in structural strengthening due to a combination of their poor adhesion on CFRP and other substrates, their mechanical properties, their chemical and biological resistance plus their longterm durability.
- **Use at elevated service temperatures**: In hot climates asphalt or concrete exposed to direct sunlight can exceed the maximum allowable service temperature of standard epoxy adhesive. Using **Sikadur®-30 LP** in connection with the **Sika® CarboHeater**, a HDT (Heat Deflection Temperature) of up to + 90°C (max. service temp. approx. + 80°C) can be reached. With no other cold curing 2 component epoxy adhesive can such a high service temperatures be achieved.
- **Fire Resistance:** Because of the higher service temperature of the **Sika® CraboHeater** cured **Sikadur®** adhesive, reduced heat isolation is necessary for the equivalent **fire resistance**.
- **Application under dynamic load**: Rigid structures, subject to vibration (such as some concrete bridges) do not have to be closed during the curing period when using the **Sika® CarboHeater**. When strengthening more flexible structures with higher vibration potential (for example timber bridges), the structure has to be closed for a shorter time.
- **Increased performance**:
  The mechanical properties of hot cured epoxy adhesives are up to 30 % higher than those cured at low temperatures (e.g. + 10°C)
- **EMPA certified performance**

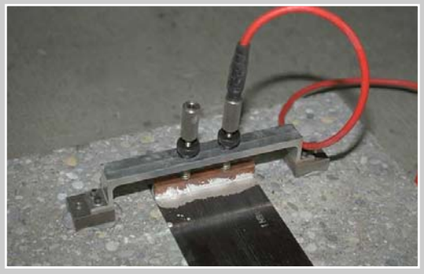


Sika® CarboHeater Unit

- Weight: 40 kg
- Dimensions: 35x65x75cm
- Power supply: 16A 380V CEE
- Quality control with automatic temperature control and timer

Sika® CarboHeater Connection Set

- Copper profiles for every CarboDur plate width
- Metal brackets, contact screws, hardware, connection ruler for serial connection
- Temperature regulating wires
- Conductive silver paint



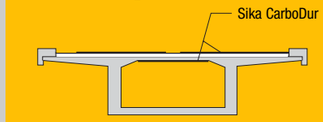
Connection Detail

- With conductive silver paint between copper profile and **Sika® CarboDur®** plate for optimum heat conduction

Sika® Strengthening Systems

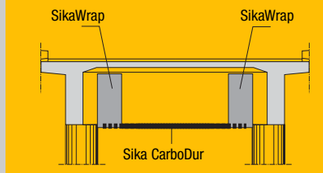
Flexural Strengthening with:

- Sika® CarboDur® CFRP plates **Sika® CarboHeater,** heating device for fast application
- **Sika® CarboStress®** prestressed CFRP plates
- SikaWrap® FRP fabric



Shear Strengthening with:

- Sika® CarboShear® L CFRP plates
- SikaWrap® FRP fabric



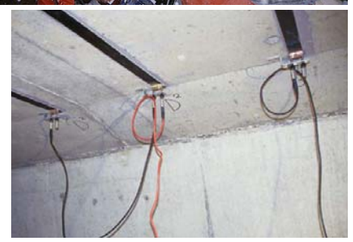
Seismic Retrofitting with:

- SikaWrap® FRP fabric

Typical Applications for the Sika CarboHeater:

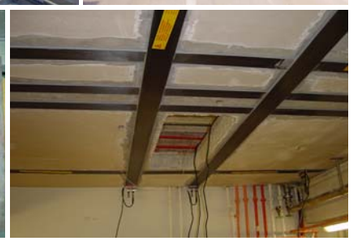
Low temperatures

- **External:** For application in cold conditions
- **For controlled curing** of the adhesive (no day - night temperature gradients), resulting in optimum performance



Fastest Installation

- **Shut downs**: Such as new machine installations, floor/door openings, entrances, stairs, wall replacement, etc.
- **Minimal disturbance in occupied areas:** In factories, tunnels, officies, stores, etc.

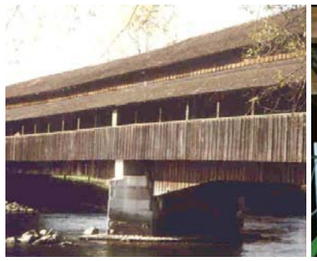


High service temperatures

- **In hot climates:** For sun exposed CFRP-plates
- **In hot environments**: Such as power stations, machine rooms, factories, etc.
- **For increased fire resistance**: With reduced necessity for heat insulation / protection

Installation under dynamic load

- **In Civil Engineering Structures:** Such as concrete, steel and timber bridges
- **For structures subject to vibration:** Such as in factories, machine rooms and carparks, etc.



Sika® CarboHeater

Technical Information

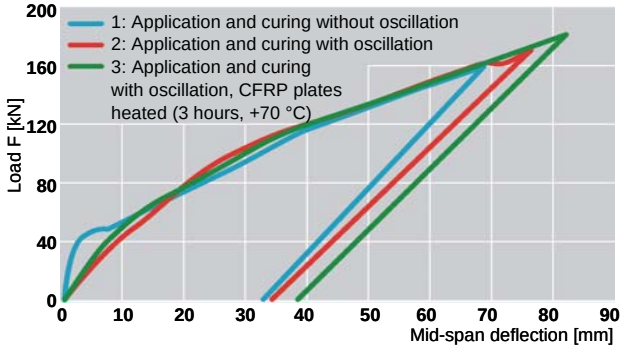
Dynamic loading test

Bonding of Sika® CarboDur® Plates to a Prestressed Concrete Slab and Curing of Adhesive under Dynamic Load

- Destructive test of specimens three hours after bonding of **Sika® CarboDur®** plates with **Sikadur®-30** adhesive.

Conclusion

- The ultimate loads are within the normal design range among specimens 1,2 and 3
- No adverse effect on ultimate load capacity during application and curing with specimen 3 - using **Sika® CarboHeater**



EMPA Test Report No. 170 569e-1, Fig.2, p. 6

Curing times

Adhesive	Without Sika® CarboHeater		With Sika® CarboHeater		
	Curing temperature		Curing temperature		
	+10 °C	+25 °C	+60 °C	+70 °C	+80 °C
Sikadur®-30	7 days	3 days	4 hours	3 hours	2 hours
Sikadur®-30 LP	not possible	7 days	6 hours	4 hours	2 hours

Service temperature

(✓ = Application without CarboHeater)

Temperature	Sikadur®-30	Sikadur®-30 Long Pot Life
+30°C	✓	✓
+40°C	✓	✓
+50°C	✓	✓
+60°C	not possible	✓ (with CarboHeater)
+70°C	not possible	✓ (with CarboHeater)
+80°C	not possible	✓ (with CarboHeater, cured at 90°C)

Application limits

Minimum Air and Substrate Temperatures During Application of Sika® CarboDur® Plates:

Adhesive	Without Sika® CarboHeater	With Sika® CarboHeater
Sikadur®-30	+10°C	non frozen substrates *)
Sikadur®-30 LP (VP)	+25°C	non frozen substrates *)

*) At low temperatures (<10°C), the adhesives are more difficult to handle (high viscosity!). It is recommended that the adhesive is stored at 20°C for at least 24 hours before application.

Attainable Temperature

1-15 meters of every plate cross-section and type can achieve a **temperature difference** (between surface temperature and attainable temperature) of **minimum 60°C**. On **concrete surfaces**, this temperature is reached after approximately 30 minutes of heating.
(Note: Shorter plate lengths can reach a higher temperature and a higher difference.)
On **wooden surfaces**, approximately 25 metres can be heated up to a 60°C temperature difference.

Parallel connections are not recommended.
Serial connection of shorter lengths of plate to create a "large plate" and therefore increase the heating efficiency is possible. This must only be done with the same type and same cross-section of plates. Connection rulers are included in the Connection Set.
For full details please consult the relevant product data sheets and the installation manual.

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